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The Investigation Of The Metacognitive Awarness And The Academic Achievement About Simple Machine In 7th Grade Students In Primary Education

Büşra AYAZGÖK*, Necati YALÇIN

Fırat University,Faculty of Education, Department of Science Education

Abstract

The aim of this research is to determine the level of metacognitive awarness and level of academic achievement about simple machine, which is a basic subject in Primary Education Science and Technology Course, and to assess correlation between metacognitive awarness and academic achivement about simple machine. The study was conducted in the second semester of 2010-2011 education year with 7th grade students of ten schools chosen randomly and located in Çankaya, Ankara. The quantative data obtained from the Metacognitive Awarness Inventory (MAI) and Academic Test about Simple Machine were analyzied using quantative analysis. In the quantitative analysis, frequency, mean, standard deviation, percentage, independent sample t-test and multiple lineer regression were used. In addition, the most convenient methods for each of the data were applied. At the end of the research a significant difference was detected in many variables. The analysis of data and diagnoises revealed the following;

- The significant difference was found between both the academic achievements of girl students and boy students about simple machine which is basic subject in primary education science and technology [t(412)= 3.08, p<.05]. However the significant difference was not found between girl students metacognition awarness and boy students metacognition awarness [t(412)= .708, p>.05].
- The positive and medium level correlation was establish between academich achievement about simple machine and metacognitive awarness (r=.353, p<0.05).
- Acording to analysis of multiple lineer regression, Metacognitive awarness clarify approximately %13 of cumulative variance of academic achivements (R= 0.353, R^2= 126, p=<.05).

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* Corresponding Author: Büşra Ayazgök
E-mail:bsstwn@hotmail.com

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Introduction

Stereotypes in education in the former location of the academic understanding leave its location to understanding of learning and the learner. Composed of different meanings of learning and the learning process for the learners, 'learning to learn' concept revealed. With learning to learn, student can become a person who more and more involved in the learning process, plans and also implent and monitor his plans, developing thinking skills, question every piece of information, adding that in the process of knowledge structures capable of self-inquiry, and can control himself and the process, identifying the competencies and shortcomings, evaluating themselves and what they do, errors that can choose by distinguishing, as a good manager can manage information. Individuals with these qualities required and expected to take place in the society nowadays individuals. Targeted training of the individual model of the information society, will learn how to know, to adjust itself to the change itself, there is no safe in the knowledge that the only difference in the information that individuals provide assurance of the research process (Töremen, 2001). 'Learning to learn' the concept of improving the quality of learning of individuals and perform their own learning processes as well as learning more active, making it an enjoyable and effective. Therefore, learning environments, learning processes organized to provide students with these features or improved. In this process, students' thinking and learning skills in activities should be developed, making them the ability to use effective strategies to develop higher level thinking skills and studied. The acquisition and use of knowledge of the individual subjects in the process of explaining the cognitive process itself (what you did, how was doing) and the process (which is what they did in the order in which you get) includes an awareness of the condition to be aware of. Here metacognitive concept that defines this awareness emerges. Metacognitive awareness of an individual to know what they will learn how to think, said to include systematic development and, as a result of learning to learn skills (Çakıroğlu, 2007). Metacognitive term is has been affirmed in the early 1970s on the basis of Meta memory term that is designed earlier by John Flavell. The common accepted is that John Flavel added metacognitive term on field of developmental psycohology. Flavel said that metacognitive have occured by monitoring and regulatory aspects in his article in 1976. The term of metacognitive has been appeared officially in this paper.

Brown who makes a lot of research on the metacognition after Flavell defined metacognition as students to use in case of planned learning and problem solving, awareness and regulation of thinking processes (Brown, 1978).

Borkowski and others (1987), explained that metacognition is self-monitoring of learning strategies and is a awareness about using these strategies. Marzano et al (1988) are reported metacognition as be aware of thinking when performing certain tasks and after using this awareness to control what we do. According to Mc Cormick et al. (1989) metacognition is, a knowledge that invidiuals have about their own thinking processes and strategies and monitoring and editing capabilities. Students should analyze and monitor thinking and learning themselves also they should think about that in this process. Metacognitive is a output of thinking consciously. İndividual is unique in education and personal differences affect learning. Each student's level of perception, learning time and learning style, varies, and this leads to the academic achievement differentiation. The same situation is true for metacognitive skills. Metacognitive skills vary from individual to individual. Studies show that metacognition is closely related to improvement. Metacognitive skills begin to 5-7 years old and will continue to develop in the school (Wolfolk, 1993; The transfer to: Akman and Erden, 1997). For this reason, students can realize to learning difficulties or problems easily, estimate the source better these difficulties or problems and use more effective strategies to learn as they grow older (Akman and Erden, 1997). Metacognition couldn’t provide success its own but serve to leraning as a mediator (Bruning et al, 1995).

İndividual who has gained metacognition skills is also able to ask the following questions and able to answer these questions:

- What is my purpose in learning this topic?
- What kind of information do I have about this topic?
- Where can I find the necessary information about this topic?
- How long time will it take me to learn this topic?
- Which tactics and strategies should I use to learn these topics?
- What plans do I do to learn this topic?
- If I made mistake how I can realize?
- Did I do my expectations meets in these processes? How to replace if the plan is not available? (Huitt, 1997).

İndividuals who able to ask these question himself and respond to these questions in their own learning process have a high level of metacognitive awareness. They affect their academic achievement positively by turning this metacognitive awareness to metacognitive skills. İndividulas, who have a high level of metacognitive skills, are perfect to plan, to manage information, to monitor, to distinguish and evaluate falsies (Schraw & Dennison, 1994). Students who have a high level of metacognitive skills, show a high level of skill to flexible scheduling, monitoring of the process of learning continuously and evaluating the other people's comprehension skills (Oliver & Herrington, 1995; Akt: Lee and Baylor, 2006).

Studies in the literature reveal the relationship between of metacognitive awareness and academic success. When studies in the literature are examined it is established that metacognitive awareness positively affects academic achievement in paralell. Despite that it is nortworty that students in working groups are generally from university. İt is determined that there is a few studies related this issue about primary, secondary school and teachers in the literature. We intended to fill this gap in literature and contribute to studies of metacognitive by our working.

2. AIM OF THE PAPER

The aim of this study to determine the level of academic achievements about pyhsical principles of simple machines and the level of metacognitive awarness of 7th grade primary school students. It is also aimed to determine whether there has been a meaningful relationship between the academic achivement levels and the metacognitive awarness levels and the meaningful differences in this relation according to gender.

3. METHOD

Model

Research method is correlation type of relational scanning. Scanning models are the research approaches that aim to describe the existing models in the past or are still continuing existence of situations as it exists. (Karasar, 2009: 77). These models are based on is without being changing conducted a survey of the condition, without being affected by any situation the definition.

Participants and Measures

The population of the study consisted of students at 7.th class primary schools in the 2010-2011 academic year in Ankara. In this study, sampling a simple random sampling method of which sampling random sampling methods (simple random sampling) were conducted.

The sample of the study consisted of 414 students who are studying at 7th class in 10 primary schools which selected with simple random sampling in Çankaya and Yenimahalle districts. 414 students show the distribution as 186 female students and 288 male students, respectively.

Primary data in the study is collected by Metacognitive Awareness Inventory (Abaci, Cetin and Akın, 2006) which developed in order to determine the level of Metacognitive Awareness of 7th grade students and by Simple Machines Academic Achievement Test (SMAAT) which developed by the researcher in order to determine their level of academic achievement on the subject of simple machines.

4. RESULTS AND DISCUSSION

The level of students' metacognitive awareness and academic achievement levels in about simple machines is researched at the first sub- problem of our study. Descriptive statistical results are presented in Table 1 and Table 2.

Table 1. Results Descriptive Statistics of students about in their scores on the MAI

SCALE	SUBSCALE	N	Number of questions	Minimum	Maximum	Level	$\overline{X}$	SS
	Declarative knowledge	414	7	17,00	35,00	Commonly	28,64	3,03
	Procedural knowledge	414	4	11,00	20,00	Commonly	16,53	1,77
	Conditional knowledge	414	6	16,00	30,00	Commonly	24,55	2,50

	Planning	414	7	15,00	35,00	Commonly	28,98	2,97
MAI	Monitoring	414	8	24,00	40,00	Commonly	33,09	2,76
	Assessment	414	6	16,00	30,00	Commonly	24,68	2,33
	Fault eliminating	414	6	14,00	30,00	Commonly	24,67	2,53
	Knowledge management	414	8	19,00	40,00	Commonly	32,93	3,04
	General	414	52	140,00	260,00	Commonly	214,00	16,45

The arithmetic average of the scores of students on MAI is calculated as ‘‘ $\overline{X}$ = 214.00’’ and the standard deviation is also calculated as ‘’16.45’’. The highest score from around the scale students have received is 260.00, and the lowest score is 140.00. According to these findings can be said that at the majority level of students have metacognitive awareness.

Table 2. Results descriptive statistics of students about in their scores on SMAAT

Scale	N	Number of question	Minimum	Maximum	$\overline{X}$	Level	SS
SMAAT	414	24	22.50	80.00	64.78	Medium level	8.74

As can be seen in Table 2, the highest point around of the scale applied to students is 80.00 and the lowest point is 80,00. The arithmetic average of the scores of students on ***SMAAT*** is calculated as ‘‘ $\overline{X}$ = 64.78’’ and the standard deviation is also calculated as ‘’8,74’’.
According to these findings, all of the students participating in the survey showed moderate success in answering all the questions of the scale.
Metacognitive awareness and academic achievement levels of students were examined by gender at the second sub-problem of our study and it is presented in Table 3.

Table 3. Independent Samples T-Test Results Related to Gender Variable of students about in their scores on SMAAT and MAI.

Scale		N	$\overline{X}$	SS	sd	t	p	η²
SMAAT	kız	228	65,96	8,54	412	3,08	.002*	.02
	erkek	186	63,33	8,77				
MAI	kız	228	213.56	17.26	412	.708	.48	-
	erkek	186	214.70	15.44				-

*p < 0.05

As seen in Table 3, scores of students from around BMABT are examined in terms of gender and significant difference in favor of girls between male and female students were found to be statistically [t(412)= 3.08, p<.05]. It can be seen, female students ($\overline{X}$ =65.96) have a higher arithmetic mean than male students ($\overline{X}$ =63.33) by examining of arithmetic average of the scores of students on ***SMAAT.*** η ² (.02) value is calculated from data to determine what level of effiċacy of gender variable on academic achievement. η ² (.02) value is showed us 2% of the total variance in students their score on ***SMAAT*** is sex-linked. This value showed us gender variable has small effect on academic achievement of the simple machines.
As seen in Table 3, MAI scores of their students are examined in terms of gender and it can be said that there was

no statistically significant difference between male and female students [t(412)= .708, p>.05]. In the other words, there is a similarity in metacognitive awareness of female and male students study at seventh class of primary school.

At third stage of sub-problem of our study we examine that are there any meaningfull relationship between metacognition awareness and academic achievement. The result of this examination is given in the Table 4.

Table 4.Person moments multiplication correlation coefficient test results of relation between seventh class students' metacognition awareness and their academic achievement on simple machines.

SİZES	1	2	3	4	5	6	7	8	9	10
1.SMAAT	1									
2.MAI	.353	1								
3.Informative knowledge	.266	.806	1							
4.Procedural Knowledge	.254	.722	.577	1						
5.Stiuational Knowledge	.228	.775	.590	.543	1					
6.Planning	.293	.797	.574	.508	.522	1				
7.Monitoring	.318	.797	.499	.524	.594	.630	1			
8.Assesment	.299	.766	.561	.470	.544	.559	.558	1		
9. Fault elimination	.291	.760	.561	.480	.483	.508	.574	.614	1	
10.Knowledge management	.265	.826	.635	.570	.596	.614	.594	.536	.557	1

As seen in the Table 4, there is a positive and medium level relation (r=.353, p<0.01) between ***SMAAT*** and ***MAI***. On the other hand as students' metacognition awareness level increases, academic achievement level on simple machines will increase.

The results in the Table 4 show that the maximum relation occurs at monitoring size (r=.318, p<0.01) and the minimum relation occurs at knowledge size (r=.228, p<0.01), This means that students have high monitoring level also have high academic achievement on the other hand, even there is a positive and medium level relation between stiuational knowledge level and academic achievement, this relation is weaker than other relations.

At the fourth sub-problem of our study, it is examined that is the level of metacognition of students study at seventh class of primary school a good or bad predictive result about acadmic achievement on simple machines. The results are presented in Table 5.

Table 5. Simple lineer regration analysis results about prediction of academic achievement on simple machines.

Variables	**B**	**Standard Error $_B$**	**β**	**t**	**p**
Constant	24.617	5.253		4.69	
Metacognitive awareness	.188	0.024	.353	7.67	.000
R= 0.353, $F_{(1,412)}$=58.812,	R^2= .126 P=.000				

As seen in the Table 5 metacognition awareness has a predictive information about academic achievement on simple machines R= 0.353, R^2= .126, F(1,412) =58.812, p<.01. It can be said that thirteen percentage of total variance in academic achievement gives meaninfull information about metacognitive awareness of students study at seventh class.

Tablo 6. Multiple lineer regression analysis results about prediction of academic achievement on simple machines.

Variables	B	Standart Error $_B$	β	t	p	Zero-Order r	Partial r
Constant	22,846	5,427		4,210	,000		
Informative knowledge	,129	,200	,045	,646	,519	,266	,032
Procedural knowledge	,258	,309	,052	,836	,404	,254	,042
Stiuational knowledge	-,169	,232	-,048	-,728	,467	,228	-,036
Planning	,218	,199	,074	1,094	,274	,293	,054
Monitoring	,459	,220	,145	2,087	,037	,318	,103
Assesment	,389	,247	,104	1,574	,116	,299	,078
Fault elimination	,263	,226	,076	1,164	,245	,291	,058
Knowledge management	,016	,203	,005	,077	,938	,265	,004
R= 0.376, $F_{(8,405)}$ = 8.023,	R^2= .137 P=.000						

According to results of regration, academic success has a low level meaningfull relation with the informative knowledge, procedural knowledge, stiuational knowledge, planning, monitoring, assesment, fault elimination and knowledge management variabiles (R= 0.376, R^2= 0.14, p<.01). Fourteen percentage of total variance in academic achievement is explained by these eight variables. In the according to the standardized regreation coefficent (β) predictive variabiles are listed according to important effect on academic success: monitoring, assesment fault elimination, planning, procedural knowledge, stiuational knowledge, informative knowledge and knowledge management.

When the t test results about regration correlation meanningfullness are examined it is seen that only monitoring variable has predictive information about academic achievement the other variables has no meaninGfull effect on the academic achievement.

5. RESULTS AND DISCUSSION

The purpose of this study was to examine the relationships between metacognitive awarness and academic achivement levels of 7th grade primary school students.

As a result of analyze, it is observed that there is a parallel relationship between the academic achivements and metacognitive awarness levels. This result is consistent with other studies in literature (Panoura ve Phillippou (2004), Canca (2005), Altındağ (2008), Demir (2009), Yabaş ve Altun (2009)).

When examining metacognitive awarness levels of 7th grade primary school students according to their gender, any statisticaly meaningful difference is not found. This result is consistent with other studies in literature (O'neil and Brown (1998), Balcı (2007), Okçu ve Kahyaoğlu (2007), Sarwer ve diğerleri (2009) ve Baykara (2011)). But, meaningful difference in the academic achivement levels of 7th grade primary school students according to their gender is observed.

When early literature which support the view that students has metacognitive awareness, gain more successfully output than other students and more efficient in learning process is examined it can be seen easily there is a important mission to students in primary school and in the other education levels.

Planning and monitoring of learning performance, metacognitive skills and metacognitive knowledge that provide

self-control, self-assesment, self-regulation ability is a guide to be a successfull person. Thus, highlighting of metacognitive skills in circulum programmes and give a significiant role in circulum programmes is critical important.

REFERENCE

Abacı, R., Çetin, B., & Akın, A. (2006), "Bilişötesi farkındalık envanteri'nin geçerlik ve güvenirlik çalışması", Educational Sciences: Theory& Practice. 7(2). Mayıs 2007. 655-680.

Akman, M. ve Erden M. (1997). Eğitim Psikolojisi; Gelişim-Öğrenme-Öğretmen Ankara: Arkadaş Yayınları.

Borkowskı, J. G., Carr, M., Pressley, M. (1987). Spontaneous strategy use: Perspectives from metacognitive theory, Intelligence, 11, 61-75.

Brown, A.L. (1978). Knowing When, Where and How to Remember: A Problem of metacognition, In R. Galaser (Ed.), Advences in instructional psychology (p.225- 223), Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Brunıng, R., Schraw, G., & Ronning, R. R. (1995). Cognitive psychology and instruction, Englewood Cliffs, NJ: Prentice-Hall.

Büyüköztürk, S. (2009). Sosyal Bilimler İçin Veri Analizi El Kitabı. Ankara: PegemA Yayıncılık.

Çakıroğlu, A. (2007). Üstbilişsel strateji kullanımının okuduğunu anlama başarı düzeyi düşük öğrencilerde erişi arttırımına etkisi. Doktora Tezi. Gazi Üniveristesi Eğitim Bilimleri Enstitüsü, Ankara.

Flavell, J. H. (1976). Metacognitive aspects of problem solving, In L. Resnick (Ed.), The nature of intelligence (.231-235), Hillsdale, NJ: Lawrence Erlbaum Associates.

Huitt, W. (1997), "Metacognition", Educational Psychology Interactive.

Karasar N. (2009). Bilimsel araştırma yöntemi. Nobel Yayın Dağıtım. Ankara.

Lee, M., Baylor, A L., (2006). Designing Metacognitive Maps for Web-Based Learning. Educational Technology &Society,9 (1),344-348.

Marzano, R., Brandt, R. S, Hughes, C. S., Jones, B. F., Presseisen, B. Z., Rankin, S. C., & Suhor, C. (1988), Dimensions of thinking: A framework for curriculum and instruction, Alexandria, VA: Association for Supervision and Curriculum Development.

Mccormıck, C. B., Miller, G. E., & Pressley, M. (1989), Cognitive strategy research: From basic research to educational applications, New York: Springer-Verlag.

Schraw, G. And Sperlıng – Dennıson, R. (1994). Assessing Metacognitive Awareness, Contemporary Educational Psychology, 19, 460-470.

Töremen, F. (2001). Öğrenen Okul. Ankara: Nobel Yayın Dağıtım.